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AUTHOR Moeller, Babette; And Others
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ABSTRACT

This paper describes the application of local area network (LAN) technology, especially electronic mail (E-mail), to develop the written communication skills of 10 deaf students in two pre-high school science classes at a school for the deaf. Students used E-mail for such activities as answering questions, keeping a log, communicating with an adult via a dialogue journal, and writing reports. Writing samples were collected at the beginning and end of the school year. In one classroom the network was used consistently throughout the school year in all areas of the curriculum, and students produced a great deal of writing on the network. In the second classroom, network activities remained separate from the curriculum and were only used during two intervals, one in the fall and one in the spring. Students in the high-use classroom demonstrated significant improvements in both the communicative effectiveness and connectedness of their writing. No improvement in writing performance was discerned for students in the second classroom. (DB)

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Using Network Technology to Create New Writing Environments for Deaf Students: Teachers' Strategies and Student Outcomes

Babette Moeller

Center for Children and Technology
Bank Street College of Education
610 West 112th Street
New York, NY 10025

Laura Bell & Carol Reich

Beginning with Children

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Abstract

Local area network (LAN) technology has great promise for supporting new writing environments for deaf students, who often have severe difficulties with written language. When equipped with electronic mail (e-mail) and other communication software, it provides students and teachers with a new medium in which written exchanges can take place, and allows students to practice writing in the process of communicating with their teachers and peers. Little is known, however, about how teachers use LAN technology in their classrooms, and whether different uses have similar or different effects. In this paper, we will report the results of a study that compared the use of LAN technology in two science classes at a school for the deaf and assessed the impact of these different networked learning environments on deaf students' writing development in an effort to identify effective approaches for integrating this technology into subject-matter learning.

Introduction

Local Area Network (LAN) technology is a system that links two or more computers so that people working at different terminals can share data files, software applications, and peripherals. This technology has great promise for supporting new writing environments for deaf students, who often have severe difficulties with written language. It provides students and teachers with a new medium in which written exchanges can take place, and allows students to practice writing in the process of communicating with their teachers and peers.

Little is known, however, about how teachers use LAN technology in their classrooms, and whether different uses have similar or different effects. In this paper, we will report the results of a study that compared the use of LAN technology in two science classes at a school for the deaf and assessed the impact of these different networked learning environments on deaf students' writing development, in an effort to identify effective approaches for integrating this technology into subject-matter learning.

Method

Two pre-high-school science classes, taught by two different teachers, participated in this research. There were five students in each class. For each class, we examined the patterns of network (e-mail) use, and evaluated students' writing development over the course of the school year. Information about network use was obtained through classroom observations, formal and informal interviews with teachers, and records of the writing produced on the network.

To evaluate students' writing development, writing samples were collected at the beginning and the end of the school year. Students wrote on general science topics and had 20 minutes to complete their essays. For each writing sample three measures were computed: a holistic score measuring communicative effectiveness, based on the ESL Composition Profile (Jacobs, Zinkgraf, Wormuth, Hartfiel, & Hughey, 1981), an error measure (a ratio reflecting the number of errors relative to the total number of words in a writing sample), and a measure of connectedness (a ratio reflecting the number of incidences in which the attempt to join information of two sentences or clauses fails relative to the total

number of sentences or clauses in the writing sample; adapted from Halliday & Hasan, 1976, and McCutchen & Perfetti, 1982).

Results

The pattern of network (e-mail) use differed in several respects in the two classrooms. Figure 1 summarizes the differences in e-mail use between the two classes, and Table 1 describes a subset of the writing activities that the teachers used with their students. In Classroom A the teacher used the network consistently throughout the school year, in all areas of the curriculum. The students in this class engaged in eight different genres of network-based activities, and produced a great deal of writing on the network (on the average, 400 lines).

In Classroom B, network activities remained somewhat separate from the ongoing curriculum. The teacher used the network in two brief intervals, once in the fall and once in the spring. Students experienced only four different genres of network-based activities, and produced relatively little writing on the network (on the average, 138 lines).

The students in Classroom A showed significant improvements in both the communicative effectiveness ($t(8) = -2.94$, $p = .019$) and the connectedness of their writing ($t(8) = 2.21$, $p = .058$) over the course of the school year. The proportion of errors also decreased for this group of students, but the difference between the pre- and post-test error measures did not reach significance. For students in Classroom B, improvements in writing performance could not be discerned. Figures 2 and 3 show the pre- and post-test scores for Classrooms A and B

FIGURE 1

PATTERNS OF E-MAIL USE IN TWO PRE-HIGHSCHOOL SCIENCE CLASSES

	CLASSROOM A	CLASSROOM B
AMOUNT OF STUDENT WRITING		
Number of messages	23 (range 20 - 25)	15 (range 5 - 33)
Number of lines	400 (range 346 - 442)	138 (range 33 - 272)
ACTIVITIES		
	Question/Answer	Question/Answer
	Tests	Dialogue Journal
	Log	Log
	Dialogue Journal	Social Messages
	Homework	
	Reports	
	Letters	
	Social Messages	

Table 1. Examples of E-Mail Activities

Question/Answer Activity
In this activity, individual students are presented with questions through e-mail, answer them, and send them back to the person who sent the question. The questioner will check the answers, correct or annotate them, and then mail them to the responder. The responder will make revisions and send the answers back to the questioner. Either teachers or students ask questions. The science teachers who participated in this project made extensive use of this activity. Teachers would use this format to present students with review questions for tests, or to have students ask each other questions. Teachers found this activity useful because it helped them to assess individual students' strength and weaknesses, and they could tailor their responses to individual students' needs. The teachers commented that this activity would be difficult to do in this form without the network.

Log
Writing a log allows students to summarize their experience in class, to record observations or procedures performed, to note questions, and to reflect on what they have learned. The teachers who participated in this project structured the process of log writing by asking students to respond to questions such as, "What did you learn today?", "What did you study today?", "Write a story that describes the activity that you did in class today.". Students mailed their log entries to the teacher.

Dialogue Journal
A dialogue journal allows individual students and their teachers to engage in an ongoing, written dialogue around issues and topics related to the curriculum (e.g., Staton, 1985). The students who participated in this project wrote to a teacher or another adult outside of the classroom (computer coordinator, English teacher, project staff) about their experience in science and with the network. Many of these written dialogues were sustained throughout the school year. Students enjoyed the individual attention they received. Students wrote entries for their dialogue journals when they finished class assignments early, or during learning center time.

Report writing
This activity involves students writing a report related to classroom topics, based on library research or experiments conducted in class. They mail a first draft of the report to the teacher, who annotates it, and then sends it back to the student for revisions. The student makes the revisions and mails it back to the teacher. This process may continue for another few rounds.

respectively. Examples of pre- and post-test writing samples from each of the classrooms are illustrated in Tables 2 and 3.

Discussion

The results suggest that the impact of LAN technology on deaf students' writing development is mediated by the kinds of strategies teachers develop for using this technology in their classrooms. Moreover, the results help to identify the conditions under which the use the technology facilitates students' writing development. It appears that if LAN technology is used frequently and consistently, and in a variety of activities that are well integrated into the curriculum, deaf students' writing development can be effectively facilitated.

Acknowledgments

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FIGURE 2

PRE- AND POST-TEST WRITING SCORES FOR CLASSROOM A

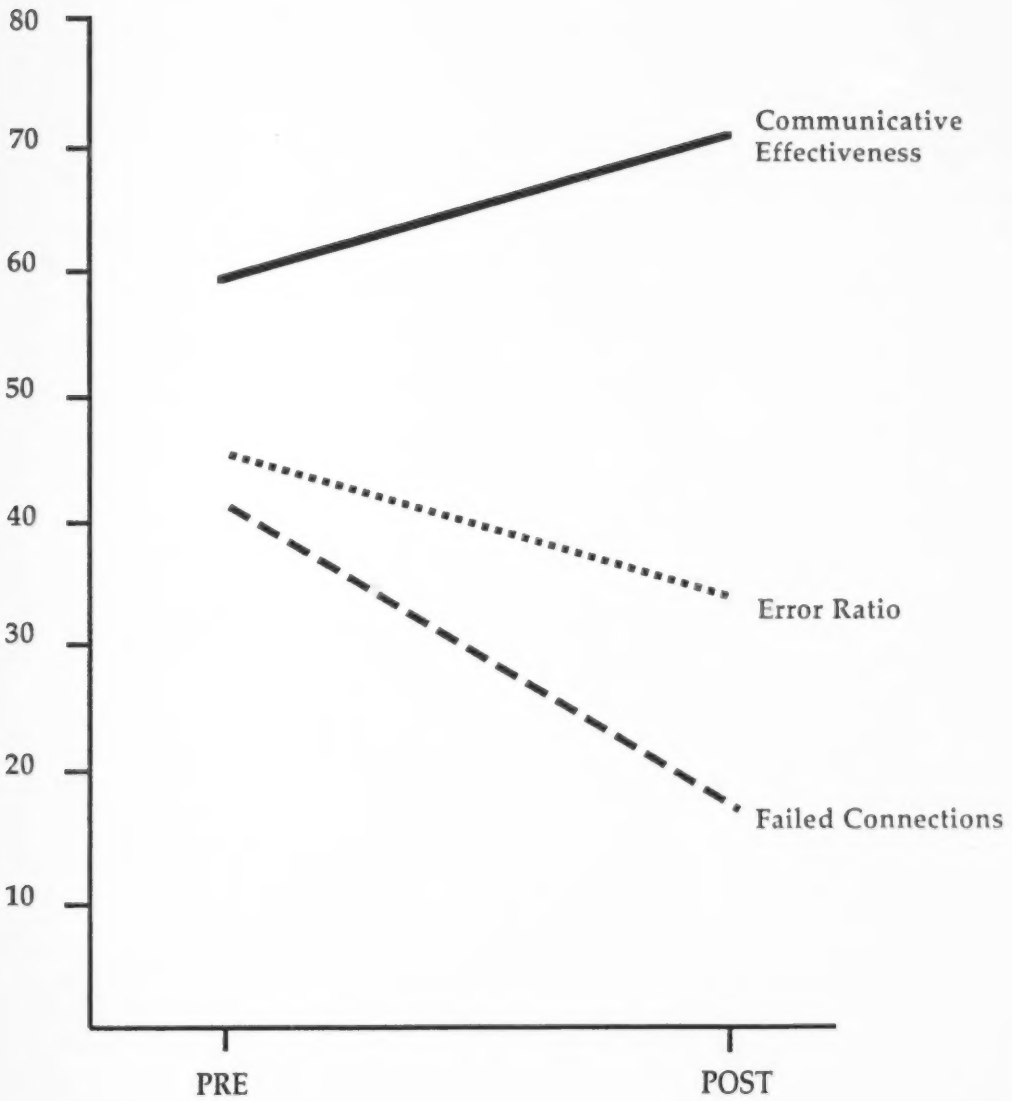

Table 2. Pre- and Post-Test Writing Samples from Classroom A

Pre-Test

Today, I learned how to use that computer and to type the keybpards. It's very interested to learned science, and what about science. I learned many thing in science, now is mesurements. That mersuremenet, we use it for cm. Becauce it was easy way for us to use for clays. We was mesurements the clays today and see how many in area inside the clays. Each person got three clays to mesurement. The clays have three different size is small , medium, and large.

Post Test

A science teacher teach me about the moon. I know about the moon alot. When the moon move around the earth It change the shape like full light, half of the light and dark you can't see. The light of the moon is from the sun. Sometime the moon was in the morning at 8 o'clock. The moon move around the earth about 23 days. The moon block from the sun. That you can't see the moon. When the moon go to east it becone the creasent moon. Later it become half moon. Later the moon look like oval. Then it become full light. Then it become oval light again then half light. Then creasent light again becone dark. It called the moon cycle around the earth.

FIGURE 3

PRE- AND POST-TEST WRITING SCORES FOR CLASSROOM ~~A~~ B

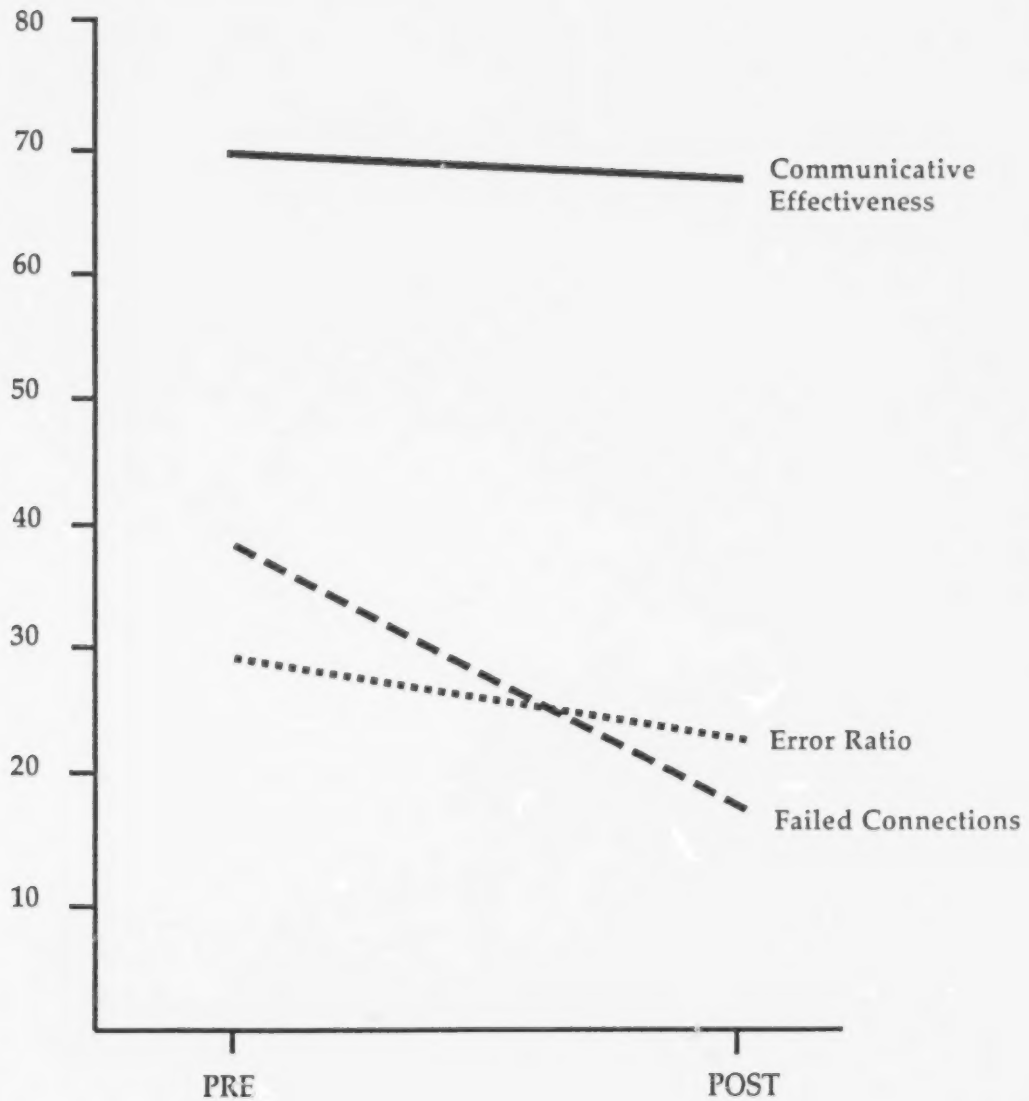

Table 3. Pre- and Post-Test Writing Samples from Classroom B

Pre-Test

My class were doing about horizon and orbit. I wrote answer the questions from the science book. The questions said, about letters on the stars.

If the person stand outside of night. The person see the sky of many stars Only the person stand on the north on the horizon at 12:00 midnight. He sees starson the horizon. At 12:00 afternoon, he sees no stars and only clouds and sun. He will be visible at midnight when the earth is in position X. He was stand above the horizon when he saw stars with letters, not all stars for all around the earth. Only the horizon can visible the stars. But, the orbit is not perfect circle,only look like oval.Then, we learn about seasons are Summer Solstice, Autumnal Equinox, Winter Solstice, and Vernal Equinox.

I answerd the questions from the science book and it shows picture from fig.2-34 and fig.2-35. So,I understand about horizon and questions.

Post-Test

Fossils

I learned that fossils from my science class. I Know that fossils where was come from under ground any where and other under ocean. The fossils are bones and that bones were from dinosaurs. And all the 7 countries were together in one supercontienal. There was no Atlantic ocean. Now, there were earth quakes with all continetals were separted. Then, Few years ago, the scienctists were found the fossils in South America and Africa, they found same bones in Africa and South America, because the scientists think that all 7 continents were together. And they think Africa is same shape from South America